

(Totten). These species, together with *Nassarius trivittatus*, probably constitute the main food supply of *Lunatia heros*² at this locality.

Five hundred specimens of *Nassarius trivittatus* were randomly selected from the above sample and the length of each was measured to the nearest millimeter in an effort to determine the age group structure of the population. No discrete age groups were apparent. The number of individuals in each size group is included below for the use of future investigators.

7 mm.: 1	11 mm.: 112	15 mm.: 19
8 mm.: 11	12 mm.: 99	16 mm.: 8
9 mm.: 39	13 mm.: 82	17 mm.: 7
10 mm.: 85	14 mm.: 35	18 mm.: 2

In addition to normal sculpture, most of the specimens exhibited one or more, somewhat irregular, variously placed, longitudinal grooves or ridges. Such irregularities were often seen on the body whorl near the aperture, but occurred with similar frequency on individuals from all size groups. These markings are probably indicative of discontinuous growth, but are apparently useless for age determination.

NOTES ON THE FRESHWATER MUSSELS OF NEW GUINEA

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The freshwater mussels of New Guinea have been studied in connection with a forthcoming revision of the group in the Australasian region. While our knowledge of the Australian and New Zealand species is still not complete, the problems remaining for solution are mainly those of distribution and the status (species or subspecies) to be accorded the known forms. On the other hand, New Guinea remains virtually an unexplored territory as far as this group of mollusks is concerned. This

² Young *Polinices duplicatus* (Say) can subsist on *Gemma gemma*. See Turner, H. J. (1951), Fourth Report on Investigations of the Shellfisheries of Massachusetts. Commonwealth of Massachusetts, Department of Conservation, Division of Marine Fisheries.

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island has an area of over 300,000 square miles, yet all the material available to me and also that which has been recorded in literature has been collected from no more than 17 localities (see map).

The following notes represent a tabulation of our knowledge to date of the New Guinea freshwater mussels, including all the records in literature known to me, as well as those which have been found in the several collections studied, but not yet recorded. Two or three lots have been found which greatly extend the range of known species, and one of these is described herein as a new subspecies. In addition, a new genus is necessary for the reception of one bizarre species.

In the locality records which follow each species, the following abbreviations for museum collections are used:

A.M. = Australian Museum, Sydney.

Q.M. = Queensland Museum, Brisbane.

S.A.M. = South Australian Museum, Adelaide.

M.C.Z. = Museum of Comparative Zoology, Cambridge, Mass.

M.Z.U.M. = Museum of Zoology, University of Michigan, Ann Arbor, Michigan.

A.N.S.P. = Academy of Natural Sciences, Philadelphia, Pennsylvania.

C.N.H.M. = Chicago Natural History Museum, Chicago, Illinois.

B.M. = British Museum (Natural History), London.

Family MUTEIIDAE—Subfamily VELESUNIONINAE

Genus *Velesunio* Iredale, 1934

VELESUNIO SENTANIENSIS (Haas), 1924, (New Combination).

Nova Guinea, 15: 72-74, pl. 2, fig. 6, text-figs. 4-12, (based on paratypes of *Unio beauforti* Bavay, 1908, *Nova Guinea*, 5: 291); Jutting, 1933, *Nova Guinea*, 17: 73-74, text figs. 3-10.

Type Locality: Lake Sentani, Dutch New Guinea. *Records*: Lake Sentani (Bavay, 1908; Haas, 1924); Moaif, Dutch New Guinea (Haas, 1924); Hollandia, Dutch New Guinea (Jutting, 1933; M.Z.U.M.; C.N.H.M.); Aitape, Australian Territory of New Guinea, (M.C.Z.); Watut River at junction of Markham River, Australian Territory of New Guinea (S.A.M.), Buna Bay, Papua (S.A.M.).

This relatively well known little species is very similar to certain forms of *Velesunio angasi* (Sowerby) from northern

Australia, and I have no hesitation in assigning it to this genus. Haas (1924) has given details of the anatomy which confirms this opinion.

VELESUNIO OVATUS (Haas), 1910, (New Combination).

Nachr. Bl. deutsch. Mal. Gesellsch., 42: 100; Haas, 1913, *Conch. Cab.*, 9, Abt. 2, Pt. 2: 161, pl. 16, fig. 5; Haas, 1924, *Nova Guinea*, 15: 71.

Type Locality: New Guinea (Fly River?) (? = Konstantinshafen, Australian Territory of New Guinea, fide Haas, 1924). Known only from the types.

The doubtful locality of this species and the remarkable resemblance it bears to the Australian species *Velesunio ambiguus* suggest that some error has occurred and that the shells were, in fact, Australian. It has not been recorded again since its description, but considering the paucity of material from New Guinea, this does not rule out the possibility of its being from that island. Until we have further knowledge of this faunula, it is left among the New Guinea species.

VELESUNIO WILSONII (Lea), 1859, (New Combination).

Proc. Acad. Nat. Sci. Philadelphia for 1859 (Vol. 11): 153; Haas, 1924, *Nova Guinea*, 15: 75, pl. 2, fig. 3; Johnson, 1948, *Nautilus*, 62: 47.

Type Locality: Eastern Branch of Isaac's Plains, N.S.W. (= Isaac's River, Queensland).

Haas, 1924, recorded a specimen from the Bailala River (= Vailala River), Papua, under the name *Hyridella wilsonii* (Lea) but the figure does not look much like the typical Australian form of this species. However Johnson, 1948, recorded a specimen under the name *Hyridella anodontaeformis* (Tapp. Canefri) from the Marco River at Merauke, Dutch New Guinea, which belongs here. I have examined Johnson's specimen (M.C.Z. No. 158459) and although it differs in a number of ways from the normal Australian form, it is not described as a new race on the grounds of lack of adequate material and the fact that the characters may be only ecophenotypical. The locality is comparatively near the Australian mainland, and a population of this species could have been established there by passive dispersal from Australia.

Genus *Microdontia* Tapparone Canefri, 1883

MICRODONTIA ANODONTAEFORMIS Tapparone Canefri, 1883.

Ann. Mus. Civ. Stor. Nat. Genova, 19: 295-296, pl. 11, figs. 3-5; Haas, 1913, *Conch. Cab.*, 9, Abt. 2, Pt. 2: 162, pl. 16, fig. 6; Haas, 1924, *Nova Guinea*, 15: 69-71, pl. 2, figs. 1 & 2, text fig. 3. *Synonym: Unio beauforti* Bavay, 1908, *Nova Guinea*, 5: 291, pl. 14, fig. 16, (According to Haas, 1924).

Type Locality: Fly River, Papua (U. beauforti = Jamur Lake, Dutch New Guinea, not Lake Sentani, fide Haas, 1924). Records: Fly River, Papua (Tapparone Canefri, 1883); Attack Point, Fly River (A.M.); Bailala River, Papua (Haas, 1924); Jamur Lake, Dutch New Guinea (Bavay, 1908); Sepik River, Australian Territory of New Guinea (A.M.).

Haas (1924) placed the subgenus *Microdontia* Tapp. Canefri in the synonymy of "*Hyridella* Swainson," but it is here considered to be worthy of generic rank. A large series in the Australian Museum reveals that the rostration of the shell is constant and that the characters of the hinge teeth and muscle scars are sufficient for generic separation from *Hyridella* auct. (not of Swainson, see McMichael, 1955). The form described as *Unio beauforti* Bavay is considered by Haas (1924) to be a synonym of the present species. The correct type locality of *U. beauforti* is Jamur Lake (on the authority of the collector, de Beaufort, fide Haas, 1924), not Lake Sentani as given by Bavay. Specimens from the latter locality have been renamed by Haas (see *Velesunio sentaniensis* above). Despite the fact that Haas examined the type of *U. beauforti* and claimed Bavay's figure and description to be imperfect, I find it difficult to believe that the two forms are synonymous, especially in view of Haas' figure 3.

Genus *Westralunio* Iredale, 1934

WESTRALUNIO FLYENSIS (Tapparone Canefri), 1883, (New Combination).

Ann. Mus. Civ. Stor. Nat. Genova, 19: 293-294, text fig. 1; Simpson, 1914, *Catalogue of the Naiades*, 3: 1295; Haas, 1924, *Nova Guinea*, 15: 7, pl. 2, fig. 4 and ? fig. 5.

Type Locality: Fly River, Papua. Records: Fly River, Papua (Tapp. Canefri, 1883; A.M.); Sabang Lager, Dutch New Guinea (= Sabang Village, 4° 47' S. Lat., 138° 47' E. Long.)

(Haas, 1924, after Schepman, 1919); Strickland River, Papua (A.M.); Aipiana, St. Joseph's River, Papua (Q.M.).

This distinctive species bears a close resemblance to the Western Australian species *W. carteri* Iredale in several characters, though it is separated by an immense geographical gap from that species. Comparatively recent changes in the climate of Australia may account for this, and the species are therefore considered congeneric for the time being. Simpson (1914) in assigning *flyensis* to the Australian group *Diplodon* (*Hyridella*) was the first to suggest any close relationship between a New Guinea species and the Australian mussel fauna. The shell from Sabang considered by Haas to belong here appears, from the figure, to be quite different and is only provisionally referred to this species.

Subfamily HYDRIDELLINAE

Genus *Leiovirgus* Haas, 1912

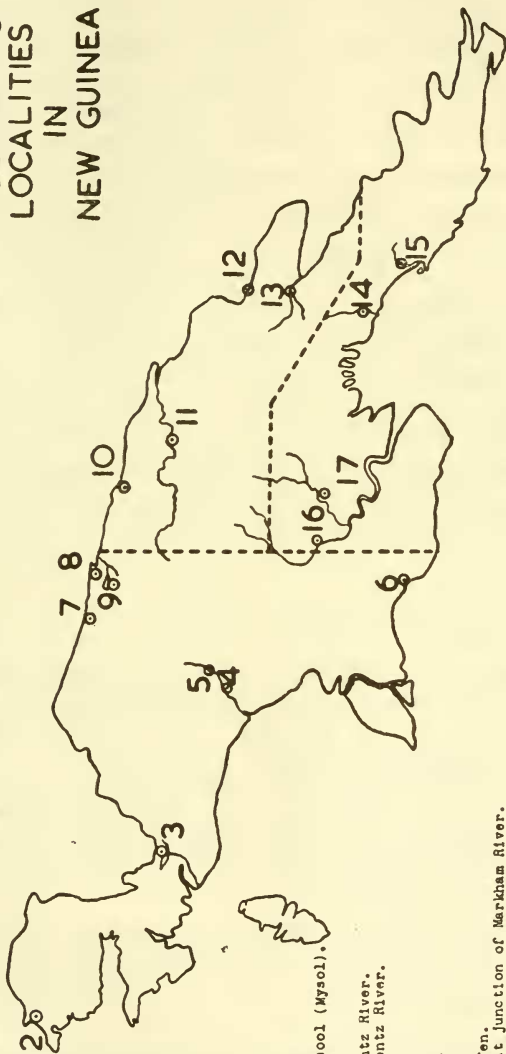
LEIOVIRGUS MISOOLENSIS (Schepman), 1897. Pl. 2, figs. 6 & 7.

Notes Leyden Museum, 18: 259, text fig.; Drouet, 1897, *Journ. de Conchyl.*, 45: 125-126; Simpson, 1900, *Proc. United States National Mus.*, 22: 852; Haas, 1912, *Conch. Cab.*, 9, Abt. 2, Pt. 2: 133, pl. 13, fig. 3; Haas, 1923, *Abh. Senckenberg. Nat. Gesellsch.*, 58: 193; Haas, 1924, *Nova Guinea*, 15: 67; Riech, 1937, *Arch. Naturgesch.* (Leipzig), 6: 86-87.

Type Locality: Island of Misool (Mysol), Dutch New Guinea. *Records*: Misool (Schepman, 1897); Sorong, Dutch New Guinea (C.N.H.M.); Fly River, Papua (A.M.).

The unfortunate association of the genus *Leiovirgus* with *Virgus* Simpson has obscured the true relationship of the present group. While *Leiovirgus* belongs with the Australian forms of the genus *Hyridella* Swainson, *Virgus* is of quite different affinity, belonging with the subfamily Cucumerunioninae (see below). The present form was considered by Riech to belong in a rassenkreis with *L. lorentzi* (Schepman) and *L. guppyi* (Smith), on the grounds that there is a progressive increase in relative height of the shell from *misoolensis* in the west to *guppyi* in the east. However, the shells differ in other characters, especially *guppyi*, which is here ranked as an eastern representative of *Leiovirgus*, the main distribution of the species

COLLECTING LOCALITIES
IN
NEW GUINEA



1. Island of Misool (Mysol).
2. Sorong.
3. Jamur Lake.
4. Sabang, Lorentz River.
5. Alkmaar, Lorentz River.
6. Merauke.
7. Hoarf.
8. Hollandia.
9. Lake Sentani.
10. Atape River.
11. Sepik River.
12. Konstantinshafen.
13. Watut River at junction of Markham River.
14. Bailala (Svillala) River.
15. Alpiana, St. Joseph's River.
16. Fly River (Attack Point).
17. Strickland River.

being the Solomon Islands, with a new race to be described below from the New Guinea mainland. On the other hand, *lorentzi* and *misoolensis* are rather similar, and I had intended to list them as subspecies, but the discovery of the right valve of a shell which agrees closely with the figured type of *misoolensis*, on a native ornament from the Fly River district, has led me to believe that typical *misoolensis* occurs right along the southwestern coast of New Guinea from the Vogelkop to the Fly River, and that *lorentzi* is probably a different species. It may be, on the other hand, only an ecophenotypical variant of *misoolensis*, its appearance suggesting a shell which has grown under optimal conditions (judging from Schepman's figure). The Fly River shell, here figured, is more sinuate along the ventral margin than the figured type of *misoolensis*, but it appears to be somewhat distorted through injury. As should be mentioned here, *Leiovirgus* Haas, 1912, Conch. Cab., 9, Abt. 2, Pt. 2: 132, type species *U. misoolensis* Schepman, 1897, has priority over *Nesonaia* Haas, 1912, Conch. Cab., 9, Abt. 2, Pt. 2: 137, type species, *Unio guppyi* Smith, 1885, because the names were published in separate livraisons, the former dated 15-2-12 and the latter 25-2-12. The names are undoubtedly subjective synonyms.

LEIOVIRGUS LORENTZI (Schepman), 1919.

Nova Guinea, 13: 186-187, pl. 7, fig. 2; Haas, 1923, *Abh. Senckenberg. Nat. Gesellsch.*, 38: 194; Haas, 1924, *Nova Guinea*, 15: 67-68, pl. 2, fig. 9, text figs. 1 & 2; Riech, 1937, *Arch. Naturgesch.* (Leipzig), 6: 86-87.

Type Locality: Alkmaar, Dutch New Guinea (Alkmaar village, Lat. 4° 40' S., Long. 138° 43' E., on the Lorentz River. This locality and Sabang (see above under *W. flyensis*) are shown on the map in Van Nouhuys, 1913, *Nova Guinea*, 7, Livr. 1, Taf. 4). Known only from the types.

For discussion of the systematic position of this species see above under *L. misoolensis*. Haas (1924) gives details of the anatomy of this species.

LEIOVIRGUS GUPPYI AIPIANUS **ssp. nov.** Pl. 2, figs. 1 & 2.

The species *L. guppyi* (Smith), 1885, has been known for many years from the several islands of the Solomon Group.

The following locality records are available: *Shortland Island*: (Types, B.M.; Haas, 1912; M.Z.U.M.; *Guadalcanal*: Aola and Marassa (Riech, 1937), Aola, Cavaga Creek, and Marovovo (M.C.Z.); *Malaita*: Buma (Riech, 1937; Haas, 1930), Fui (? = Fiu) (A.N.S.P.); *San Cristoval*: Kira Kira (Riech, 1937); *Bougainville*: Mamalomino (Reich, 1937); *Santa Isabel*: Fula-kora (M.C.Z.); *Ugi Island* (A.M.).

Notably two large islands are not included in these records, *Choiseul* and *New Georgia*.

In the Queensland Museum are two shells from Aipiana on the St. Joseph's River (= Angabunga River), collected by Charles Hedley in 1890. These shells differ from the two forms described from the western part of New Guinea (*misoolensis* and *lorentzi*) but are quite similar in form, sculpture and hinge characters to *guppyi*. The shells are a little less winged than typical *guppyi*, and the hinge teeth are not quite so strongly developed, though they are juveniles. The beaks are more medially situated, being about one-quarter of the length from the anterior end, whereas in typical *guppyi* they are between one-sixth and one-seventh. The Aipiana shells are relatively higher at the position of the beaks than typical *guppyi*, this being the cause of the absence of the winged appearance. Thus, while the maximum height of the Aipiana shells relative to the length is similar to *guppyi* (about 50%), the height at the beaks relative to total length is only 36% in *guppyi*, while it is 45% in the present form.

Specimen	Total Length	Beak Length	B.L. T.L.	Maxi- mum Height	Beak Height	B.H. T.L.	Width
<i>L. g. aipianus</i>							
Holotype	44	10	23%	22	20	45%	10
Paratype	43	11	26%	22	21	49%	10
<i>L. g. guppyi</i>							
Holotype	75	12	16%	36	27	36%	20
<i>L. g. guppyi</i> Cavaga Creek, Guadalcanal (MCZ)	42	7	17%	22	15	36%	11

The Aipiana population is here named as a new subspecies, *Leiovirgus guppyi aipianus*, the holotype being No. Mo.2798 in the collection of the Queensland Museum, while the paratype has been lodged in the Australian Museum, No. 62203. The

dimensions in mm. of the types, and of comparable specimens of *L. guppyi guppyi* are given below.

The discovery of a population of *Leiovirgus guppyi* in the southern part of New Guinea suggests that the species may be much more widely distributed than had been thought previously. It may occur over much of southern New Guinea and possibly on the larger islands of the Bismarek Archipelago.

Subfamily CUCUMERUNIONINAE

Genus *Virgus* Simpson, 1900

VIRGUS BECCARIANUS (Tapparone Canefri), 1883.

Ann. Mus. Civ. Stor. Nat. Genova, 19: 291-292, pl. 11, fig. 2. *Synonym: Unio mattirolii* Tapparone Canefri, 1883, *Ann. Mus. Civ. Stor. Nat. Genova*, 19: 292-293, text fig. i. *Simpson*, 1900, *Proc. United States Nat. Mus.*, 22: 852; Haas, 1912, *Conch. Cab.*, 9, Abt. 2, Pt. 2: 129, pl. 13, fig. 1, and p. 131, pl. 13, fig. 2; Haas, 1924, *Nova Guinea*, 15: 66 & 67.

Type Locality: Fly River, Papua (both *beccarianus* and *mattirolii*). *Records: Fly River* (Tapparone Canefri, 1883; A.M.); "British New Guinea" (M.Z.U.M.).

As suggested above, the genus *Virgus* is considered to have nothing to do with *Leiovirgus*, but to belong with the Australian species *Cucumerunio novaehollandiae* (Gray) and certain New Zealand forms in the subfamily Cucumerunioninae. The two species *U. beccarianus* and *U. mattirolii* were described together by Tapp. Canefri, from the same lot. Tapp. Canefri considered that the species were separable in large series even though each showed some variability. The two forms are, however, very similar and a large series in the Australian Museum reveals that the characters on which they were separated are so variable as to be of little taxonomic value at this level. Possibly the two forms represent different ecophenotypes, or variants of a polymorphic species. In either case, I have no hesitation in placing *mattirolii* as a subjective synonym of *beccarianus*. Although the two names were published simultaneously, *beccarianus* has page priority, is the more common form, and was named as the type of *Virgus*. I therefore select it as the name to be used for this species.

Family UNIONIDAE—subfamily *Rectidentinae**Haasodonta* gen. nov.

Type Species: Hyridella fannyae Johnson, 1948, *Nautilus*, 62: 47-48.

Description: Freshwater mussels, of almost anodontine facies, probably belonging to the subfamily *Rectidentinae* Modell. Hinge line long and straight; hinge simple, with elongate, lamellar, lateral and cardinal teeth; shells compressed anteriorly, swollen posteriorly, particularly along the posterior ridge which is greatly expanded; posterior-dorsal margin winged, so that the greatest length posterior to the beaks is just below the dorsal margin (hinge-line); periostracum brown; shell substance of moderate thickness.

This genus is apparently allied to *Physunio* Simpson from which it may have been derived. It may be distinguished from that genus by the heavier shell and much more swollen posterior ridge. The hinge line is straight, whereas in *Physunio* it is gently curved. There is no evidence of the development of a third lateral tooth in *Haasodonta*. Since this new genus is based on the single known specimen of *H. fannyae*, its precise limits cannot be defined. Anatomical investigation will prove or disprove the suggested relationship with *Physunio* and the subfamily *Rectidentinae*, as that group differs greatly in anatomy from the other New Guinea and Australian groups. Meanwhile, the peculiarity of form in the species, which bears little resemblance to any of the species of *Hyridella* or *Vele-sunio*, demands the erection of a new genus for its reception.

HAASODONTA FANNYAE (Johnson), 1948, (New Combination).

Pl. 2, figs. 3 to 5.

Nautilus, 62: 47-48, pl. 3, fig. 1.

Type Locality: Marco River at Merauke, Dutch New Guinea.
Records: Known only from the unique holotype (M.C.Z. No. 160663).

The affinity with *Physunio* suggested above, if proven, means that the species is a member of the family Unionidae, as distinct from the family Mutelidae which includes all the remainder of the Australasian species. It seems probable that the Australian-New-Zealand-New Guinea mutelids have been isolated in this region along with the marsupials and other ancient groups since the Cretaceous and that *Haasodonta fannyae* is a relatively

recent immigrant from Indo-Malaya. To date it is the only non-Australasian element in this faunula. (The family Mutelidae occurs in Africa, southern South America and Australasia, while the Unionidae is found in Europe, Asia, North America, northern South America and Africa. The Indo-Malayan species are all Unionidae, with the exception of a few aberrant forms of the family Mycetopodinae.)

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DISTRIBUTION OF LIVING GLYCYMERIDS WITH A NEW SPECIES FROM BERMUDA

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Living members of the pelecypod family Glycymeridae can be divided into two large groups of species, and in a general way these two groups can be distinguished on the basis of the ornamentation on the exterior of the shell or, more specifically, the kind of ribs each has. The more ancient, more widely distributed geographically, and more numerous in species is the group typified by *Glycymeris*, *sensu stricto*. This group has shown relatively little change in ornamentation since the Glycymeridae first appeared in the early Cretaceous. Basically, the *Glycymeris* group has wide and relatively flat radial ribs with superimposed radial striae. Furthermore, living specimens usually have a luxuriant development of hair-like periostracum. Other genera and subgenera that can be placed in the *Glycymeris* group are *Glycymerula* Finlay and Marwick, 1937; *Veletuceta* Iredale, 1931; *Glycymerella* Woodring, 1925; and *Pseudaxinea* Monterosato, 1892. *Pseudaxinea* does not have radial striae on the large ribs, but the remaining morphologic characters

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